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Subject: Food Web Modeling/Willis Ave. Loading Comments

As a follow-up to our Onondaga Lake Eco Risk Assessment telephone conference (Tuesday, March 13th), I have attached two files the first of which highlights comments we had discussed, in general, regarding the incorporation of a food web model into the revised BERA. The second file relates to loading calculations for the Willis Avenue site (based on our review of the loading calculations in the Willis Avenue draft RI Report).

As you know, Honeywell submitted a document providing details on Honeywell's food web model, via email, on January 4, 2001. As discussed previously, a statement of justification for utilizing the probabilistic risk assessment approach and a workplan documenting the development of the probabilistic risk assessment approach was not provided until this past Friday (March 30, 2001), and therefore, the attached comments do not address that submittal. Honeywell remains responsible for submitting a complete, approvable revised BERA Report that is fully responsive to all prior comments by the Department and the USEPA on/or before the due date of April 23, 2001 according to the stipulated schedule. If Honeywell elects to include the probabilistic risk assessment approach and/or a food web model in the revised Lake Bottom BERA, the attached comments will need to be adequately addressed in the revised BERA. In addition, the revised Lake Bottom RI Report should adequately address the attached comments on Willis Avenue loadings.

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Food Chain Comments 032001 WillisHgLoadingFinal.

Review of Honeywell's Proposed Approach (January 4, 2001) Food Web Modeling - Onondaga Lake BERA

PART 1 of 2 - COMMENTS ON FOOD CHAIN MODEL TEXT

General Comments

G.1 The problem formulation should be expanded and assessment endpoints clearly defined for the BERA. This is also Condition 1 for an acceptable risk assessment that uses probabilistic analysis techniques (USEPA, 1997a). A discussion of highly exposed or highly susceptible species (e.g., threatened or endangered, protected) or life stages should be included in this section. In addition, adequate risk questions examining direct and indirect risk need to be developed (e.g., effects on benthic community as it relates to food for fish and benthivorous birds). Please refer to ERAGS (USEPA, 1997c) for a discussion of developing appropriate assessment endpoints.

G.2 Fish should be added as receptors. Toxicity reference values (body burdens) should be selected for screening calculations for forage and piscivorous fish receptors. In addition, risks to the benthic community and aquatic plant community need to be evaluated.

G.3 Receptors selected should serve as models of species that may be exposed to contaminants at Onondaga Lake, which contains adequate habitat to support all receptor species. Therefore, reducing exposure of receptor species by calculating foraging areas from nesting, roosting, or burrowing sites other than those located in Onondaga Lake does not address the risk questions that should be asked in this BERA. In addition, Onondaga Lake has been contaminated for decades and using current population data to determine risks provides an imprecise and possibly inaccurate picture of ecological risks.

G.4 Populations/subpopulations of receptors should be clearly defined. The individuals of a species living around Onondaga Lake should make up the population/subpopulation under consideration. The BERA report should assess the additional uncertainty that will be introduced into the BERA by not having site-specific population data.

G.5 The deterministic and probabilistic modeling proposed for the BERA need to be clarified. The position paper does not give enough details on when and how probabilistic modeling will be used. Condition 2 for an acceptable risk assessment that uses probabilistic analysis techniques requires that all methods used for the analysis (e.g., models, data, software names, etc.) are to be documented and easily located in the report (USEPA, 1997a). The BERA as a whole should be clear, consistent, reasonable, and transparent as stated in USEPA's 1995 Policy for Risk Characterization (USEPA, 1995). See comment G.6 for additional concerns relating to this issue.

There are not enough data available to determine the likelihood of receptor exposure to sample a (L[EXP]) in a deterministic risk assessment. All parameters, including P, should be clearly defined. Each receptor population would have to be extensively studied to provide adequate data for the exposure concentration equation (SOC_x). A probabilistic equation could incorporate random exposures to various samples, in addition to evaluating a range of exposures for other parameters. A probabilistic analysis can be performed in addition to, rather than instead of, deterministic analyses. However, a probabilistic risk assessment should follow EPA guidance (USEPA, 1997b) outlined in Guiding Principles for Monte Carlo Analysis (USEPA, 1997a).

G.6 The Probabilistic Risk Assessment (PRA) should prepared according to USEPA guidance and consistent with the following:

Information Required in the Pre-BERA Technical Memo:

a. Statement of the ecological assessment endpoints
b. Value added by conducting a PRA and proceeding to subsequent tiers
c. Rationale for the PRA
d. Discussion of the adequacy of environmental sampling for PRA or moving to successive tier (e.g., data quality issues)
e. Description of the methods and models to be used (e.g., model and parameter selection criteria)
f. Proposal for obtaining and basis for using exposure factor distributions
g. Methods for deriving the concentration term
h. Software (i.e., date and version of product, random number generator)

Types of Information Required in the BERA:

Objectives and purpose

Assessment endpoints
Benefits of performing a probabilistic risk assessment
Site conceptual model
Strategy for separation of variability and uncertainty

Input Distributions and Assumptions

Variability and uncertainty - Are there clear distinctions and segmentation of distributions?
Data sources - Are the data or analysis sources for developing or selecting distributions documented and appropriate?
Distribution forms - Documentation for selecting distribution forms.
Distribution parameters - Documentation of analyses used to estimate parameters.
Distribution tails - Evaluation of how methods precisely depict distribution tails.
Truncations - Are there any distributions truncated, do they make sense?
Concentration term - Adequately document derivation of concentration term.
Variable correlations - Address variable independence and correlations.
Time step - Documentation of basis for time step.

Sensitivity analysis - Has a sensitivity analysis been performed? Documentation of the validity of statistical analysis and the impacts on uncertainty.

Model Structure and Computational Mechanics

Flow Chart - Diagram of computational sequence.

1D/2D MCA - Is a 1D or 2D MCA being implemented? What is represented by either or both dimensions?

Algorithms - Adequate documentation to recreate analysis.

Integration - Documentation of algorithms used in numerical integration.

Dimensional analysis - Documentation of unit analysis to ensure equations balance dimensionally.

Random number generation - Documentation of random number generator.

G.7 When TRVs are based upon chronic toxicological studies, then exposure should be considered to be 365 days and no adjustment should be made for exposure time. Most studies selected for TRVs are chronic studies. An uncertainty factor should be applied to subchronic studies, if no appropriate chronic study is available.

G.8 It is unclear how the population and subpopulations will be calculated, along with specific foraging areas (and respective COCs) which will be used in the proposed modeling. Please indicate whether calculations were based on seasonal, diurnal/nocturnal observations and surveys. Also, whether the age and sex of individuals (i.e., differing diets, metabolisms, lifestyle habitats, etc.) will be considered in these calculations.

Specific Comments

S.1 Risk Analysis for Terrestrial Wildlife (page 1), paragraph 1, second sentence. One of the objectives of the proposed modeling approach is to progress to a site-specific baseline ecological risk assessment (BERA) by using site-specific data and observations. However, site-specific data on receptor species at Onondaga Lake are limited to presence/absence and nesting observations. There have been no systematic studies of receptor populations, nor have any receptor tissues or eggs been analyzed for site-related COCs. These deficiencies must be assessed in the uncertainty section of the BERA.

S.2 Contaminant Transport and Fate, Ecosystems Potentially at Risk, and Complete Exposure Pathways (page 2), first bullet. The mouths of lake tributaries, the lake outlet up to the outlet sampling point, and contiguous wetlands are part of the Onondaga Lake site as discussed with Honeywell and Exponent at the December 7, 2000 meeting.

S.3 Selection of Assessment Endpoints

a. The selected assessment endpoint is too broad and needs to be broken down into several assessment endpoints, each with clearly defined measurement endpoints. This was discussed with Honeywell and Exponent during our December 7, 2000 meeting.

b. Although specific receptors are examined, they are selected to represent models of species with similar feeding and habitat requirements.

S.4 Conceptual Model and Risk Questions

a. Pelagic. Fish living in Onondaga Lake should be modeled as receptors (e.g., forage fish, piscivorous fish). Adequate risk questions need to be developed. This was discussed with Honeywell and Exponent during our December 7, 2000.

b. Pelagic. Subpopulation is not an appropriate unit for measuring receptor effects. Effects should be determined for populations of the Onondaga Lake osprey and double-crested cormorant (which may be small populations). Although the proportion of the population that may be adversely affected due to exposure to contaminants can be estimated using a probabilistic model, whether that proportion is high enough to adversely affect population sustainability may be difficult to evaluate. We have to question the validity of the osprey only feeding in the deep water areas of the lake. Poole (1989) states that osprey prefer feeding along shallow flats and shorelines. Additional measurement endpoints, such as point estimate endpoints, should be considered (i.e., is there an exceedance of the TRV).

c. Littoral/Wetland. The receptors selected represent various routes of exposure to contaminants in Onondaga Lake. Piscivorous mammals are likely to be at greatest risk. As in the previous comment: 1) assessment endpoints should address Onondaga Lake populations and 2) there are difficulties involved with estimating the percent of the subpopulation affected by contaminants.

d. Dredge Spoils. The receptors selected, which are used to model species with different feeding strategies, are not necessarily the species at greatest risk in these groups. As noted in previous comments, the receptor unit examined should be the population, rather than subpopulation. Additional measurement endpoints, such as point estimate endpoints, should be considered (i.e., is there an exceedance of the TRV).

S.5 Characterizing Exposures (page 4), first sentence. The physical presence of receptors in time and space with contaminants does not have to be field verified. Factors such as the contamination itself may affect the distribution of specific receptors. Onondaga Lake has been contaminated for decades and using current population data to determine risks provides an imprecise and possibly inaccurate picture of ecological risks. Further clarification is necessary because it appears that since no pelagic fish were collected the risk to osprey will not be evaluated.

S.6 Characterizing Exposures (page 5), point/scenario 1. Tier 1 is not intended to be used as a worst-case exposure. The framing of Tier 1 in this way introduces a bias against finding potential effects and should be rephrased, as agreed to in our December 7, 2000 meeting. Maximum exposure is evaluated in the screening-level phase of the risk assessment where parameters such as minimum body weights and maximum ingestion rates are used. Some parameters used in the screening (e.g., body weight, residence time) were not provided in the screening calculations.

S.7 Characterizing Exposures (page 5), point/scenario 2. The double-crested cormorant is the only receptor that is considered unlikely to nest at Onondaga Lake. This begs the question why was the cormorant selected as a receptor species to represent a piscivorous bird found at Onondaga Lake? Unless strong justification is provided for the selection of the cormorant, it should be eliminated as a receptor species. It should be noted why the receptor's home range will be centered on the western shore of the lake.

S.8 Characterizing Exposures (page 5), point/scenario 3. The analysis of risks considered to exist in 1992 using known nesting and foraging locations is an invalid exercise that should be eliminated from the BERA. The reason for deleting this scenario is that conditions in 1992 do <u>not</u> reflect baseline conditions since the lake has had active chemical manufacturing plants operating on its shoreline for about 100 years. Therefore, both the number of species and individuals using Onondaga Lake for foraging and nesting are likely to be lower than under baseline conditions. The objective of the BERA is not to determine risks to animals currently found in contaminated areas, but to determine if contaminated areas are likely to cause risks to species that would be found in similar habitats under normal conditions. Risks from approximately 100 years of contamination impacting the lake must be discussed in detail in the report.

S.9 Characterizing Exposures (page 6), exposure rate equation 1. It is unclear from this equation whether specific locations/areas of Onondaga Lake or the entire lake will be evaluated. Without an intensive study of receptor populations, the uncertainty associated with location-specific estimates is too great for use in the BERA. In addition, modeling of current individuals of a specific population limits the applicability of the receptor as a model for similar species. How many individuals are being modeled? Provide details on how many individuals are being modeled and what determines the number of individuals in a subpopulation. The source(s) of the equations presented should be cited.

S.10 Characterizing Exposures (page 6), exposure rate equation 1. Please indicate whether the "representative COC concentration in the receptor's prey" will be based on actual tissue data, or BAF/BACs.

S.11 Characterizing Exposures (page 6), paragraph below exposure concentration equation 2. Revised Table 1 provides too many size classes. A limited number of size classes should be used because a larger sample size increases the confidence of the COC concentration. It should be noted that the osprey prey selection does not match the Van Daele and Van Daele (1982) size distribution summary on page 2-69 of USEPA's Exposure Factors Handbook. The prey distribution provided for the great blue heron does not coincide with the 20 to 28 cm range for heron foraging in lakes cited in the Sheboygan River and Harbor Aquatic Ecological Risk Assessment (USEPA, 1998), which is also based on Alexander 1977. The prey selection factors for all receptors should be checked.

Another issue with using such specific size distributions is that the fish available at the study location may differ substantially from species available at Onondaga Lake. For example, Alexander (1977), the source of four of the six size distributions, studied the food of vertebrate predators in trout waters in north central lower Michigan (Honeywell/Exponent should provided a copy of this paper to NYSDEC). However, no trout (or other salmonids) were analyzed in the September 2000 sampling or in the 1992 sampling (as presented in the Draft BERA), although rainbow trout, brown trout, brook trout, and splake have been collected at the lake (Table 4-6 of the Draft BERA). Salmonids comprised 21% of the fish caught by ospreys at an Idaho reservoir in the Van Daele and Van Daele (1982) study used to determine prey selection sizes for the osprey.

Although there are shortcomings in the prey selection data, it can be used with appropriate caveats, but only to represent general feeding patterns (e.g., as for a receptor model), rather than for specific individuals.

S.12 Characterizing Exposures (pages 6 and 7), paragraph below exposure concentration equation 2, third sentence on, incidental sediment exposure. The assumption of exposure to high concentrations of contaminants in both prey and sediment is conservative, but logical. The BERA must provide the rationale for the basis of the "assessment unit."

S.13 Characterizing Exposures (pages 6 and 7), paragraph below exposure concentration equation 2, last two sentences. Exposure rates should be expressed as the 95 percent UCL for this deterministic risk characterization.

S.14 Characterizing Exposures (page 7), Tier 1 equation. As discussed in the December 7, 2000 meeting, this tier was to evaluate the risks to receptors with area and time use factors of 1. Inclusion of ($P_{not\text{-}ny} \times EER_{bkgrnd}$) is not warranted. In the Tier 1 calculations, indicate whether EER should be EEC (the variables may be confused).

S.15 Characterizing Exposures (page 7), Tiers 2 and 3 equation. The derivation of values to be used for each receptor as the proportion of time spent at any given assessment unit A (P_{siteA}) is extremely problematic given the limited information on receptors at Onondaga Lake. There are no detailed studies available for any of receptors selected. The most detailed information on nesting locations is based on discussions with NYSDEC's New York Natural Heritage Program. The Natural Heritage database is not intended as a substitute for specific field studies and should not be used as such. The presence of nesting in these areas shows that there are not conditions that preclude populations of these species from being found in specific areas. In addition, the Natural Heritage Program data is not a comprehensive data base and does not include all observations of the receptor species.

The following information on nesting areas for the great blue heron and osprey is from NYSDEC Region 7 personnel and should be incorporated into the analysis:

Based on discussions with NYSDEC Region 7 personnel and their wildlife biologist Lance Clark - great blue heron are nesting within the Three Rivers Wildlife Management area which is closer to Onondaga Lake than Cross Lake, the population that Exponent uses in their food web model. Also, the wildlife management personnel in Region 7 have stated that they would not be surprised if single nests are found in wetland areas in and around Syracuse and Onondaga Lake.

In further discussions with Lance Clark he indicated that osprey are nesting closer to Onondaga Lake than even the Three Rivers Wildlife Reserve. He mentioned that osprey are nesting on an annual basis in Clark Marsh which is approximately 3.4 miles (5.5 km) from Onondaga Lake which is closer to Onondaga Lake than Oneida Lake. Osprey are also nesting at Cicero Marsh which is approximately 6.8 miles (10.9 km) from Onondaga Lake but is closer to Oneida Lake than Onondaga Lake. He doubts that the Three Rivers population of osprey (about 5.8 miles from Onondaga Lake) would use Onondaga Lake since there is enough food in the rivers and ponds of the reserve for them not to venture out of the reserve to forage. Lance also mentioned that osprey have attempted to use the rail yard in East Syracuse (approximately 6 miles from Onondaga Lake) but have not returned. Based on discussions with regional NYSDEC personnel, it is possible that Onondaga Lake may make up the majority of the source of food for some osprey nesting in the Onondaga Lake area.

S.16 Characterizing Exposures, Table 2. The foraging radius parameter presented in Table 2 represents mean and maximum; rather, minimum and maximum exposures should be presented to represent the range of exposures (a separate column can be presented for means). The following changes should be made to Table 2:

- The range of the osprey, great blue heron and double-crested cormorant should be adjusted to reflect the min-max range. The mean can be presented in a separate column.
- The mean body weight (and associated ingestion rates) of the river otter should be used, rather than the lower end of the range cited.
- TAMS and Menzie-Cura (1999) considers the belted kingfisher, great blue heron, mallard duck, little brown bat, and tree swallow to be full-time residents of the Hudson River based on their reproduction and growth. As full-time residents, they were assumed to have a temporal exposure factor of one. The residence time in days was not provided in TAMS and Menzie-Cura (1999) for the mallard or little brown bat (only months of residence were provided) and no minimum residence time was provided for the heron.
- In addition to previously mentioned species, the red-tailed hawk, double-crested cormorant and osprey should be considered full-time residents of the lake based on their reproduction and growth.
- TAMS and Menzie-Cura (1999) did not evaluate the osprey as a receptor and should not be cited for this receptor. They used a sediment ingestion rate of 1% for the kingfisher (rather than 0%) based on potential exposure during nesting (in banks) and grooming.
- Note: some food ingestion rates used in screening calculations were approximately four times selected BERA ingestion rates. No explanation for selection of these rates was provided. Ingestion rates should be clearly labeled as wet or dry weight.

S.17 Characterizing Exposures (page 8), body weights. Median body weights from the northeast US were not presented for the mallard (range presented for North America), mink (Montana population), and river otter (lower end of weight range throughout North America). Of receptors with values from the northeast US, few were New York State derived, i.e., short-tailed shrew (New Hampshire), red-tailed hawk (Michigan/ Pennsylvania), osprey (Massachusetts), great blue heron (eastern North America), and belted kingfisher (Pennsylvania). Only the little brown bat and tree swallow body weights are for New York State populations. The geographic location that the cormorant body weight is based on could not be determined. Because of the lack of site-specific data, calculations using assessment units (as proposed) are inappropriate for the BERA.

S.18 Characterizing Exposures (page 8), media intake values, last sentence. Please explain in detail the use and derivation of uncertainty factors.

S.19 Characterizing Exposures (page 8), migration cycles. Receptors that may be year-round residents should be considered as such. If a toxicological study is considered chronic, then exposure should be considered to be 365 days. Chronic effects are often studied in periods less than a year, during crucial reproductive or growth periods. The calculation of migration cycles should account for young-of-the-year organisms.

S.20 Characterizing Exposures (page 9), migration cycles, equation 4. This equation is unnecessary since all temporal exposures should be considered to be one.

S.21 Characterizing Exposures (pages 9 through 11), foraging area. The three receptors for which a range of foraging area has been provided in Table 2 are the great blue heron, double-crested cormorant and osprey. However, the mean foraging area for all these species is less than the habitat represented by Onondaga Lake. Therefore, all receptors should be considered to forage exclusively in the Onondaga Lake area, as proposed in the Tier 2 analysis. The Tier 3 analysis centering on the closest identified nesting, roosting, or burrowing site should not be performed since current colony preferences may be affected by current levels of contamination in the lake. In addition, there may not be sufficient data to support this approach, as some contaminated areas (e.g., other subsites) within radii (extending up to 40 km from colony locations) may not have adequate chemical data for analysis. Reports or scientific literature may be inadequate or inappropriate to estimate background concentrations.

S.22 Characterizing Exposures (pages 9 and 10), foraging area. The appropriateness of the foraging ranges presented should be examined. For example, the range of the great blue heron is given as 3.1 km (mean foraging area) up to 24.4 km (Dowd and Flake 1985, as cited in USEPA 1993). However, this study was performed along South Dakota rivers and streams and the maximum foraging area from this study should not be used for Onondaga Lake, where nesting may occur.

S.23 Characterizing Ecological Effects (page 11), paragraph 1. The lower bound of the threshold should be based on consistent conservative assumptions and NOAEL toxicity values. The upper bound can be based on observed impacts or developed using consistent assumptions, site-specific data, LOAEL toxicity values, or an impact evaluation. Thus, the threshold approach provides a range of estimated adverse ecological effects. The approach to determining thresholds for adverse effects should have been specified in the study design (ERAGS Step 4).

S.24 Characterizing Ecological Effects (page 11), paragraphs 2 and 3. The procedure for selecting TRV studies and uncertainty extrapolations should be clearly defined and is needed by NYSDEC to review the BERA parameters. This implies that only studies that used fish as the food source to develop a LOAEL or NOAEL will be used to derive the TRV for the BERA, which is not appropriate. In addition, the derivation of a NOAEL from a LOAEL should be through the use of uncertainty factors as highlighted in ERAGS Section 1.3.1, page 1-10.

S.25 Characterizing Ecological Effects (page 12), item 1. More recent derivation is included in TOGS 1.1.1.

S.26 Risk Estimation (pages 12 through 14), paragraph 1. It appears that risk will be estimated using a deterministic model based on the 95% UCL and a probabilistic model to estimate the portion of the population whose projected exposure exceeds the TRV. However, there are several issues that need to be clarified in regard to the proposed probabilistic modeling, including:

a. Probabilistic modeling can be a viable tool for analyzing variability and uncertainty in risk assessments as part of a tiered approach, progressing from simpler to more complex assessments (USEPA, 1997a). It appears that Honeywell/Exponent proposes to perform probabilistic assessments at each of the three tiers, rather than at only the final tier, as recommended by USEPA.

b. The relationship between the percent of the population affected and population sustainability is unclear. There are limited New York State and site-specific data available for receptors for exposure parameters. The limited data make it difficult to estimate the population size, mortality rate, and reproductive rate with any degree of confidence, since these parameters may vary substantially among populations (e.g., see USEPA, 1993).

S.27 Risk Estimation (page 12), paragraph 3. Risk due to background concentrations should not be separated from the total risk calculated in the risk characterization. Background risk may be presented in the uncertainty section of the BERA. Under risk estimation, individual effects must be assessed. Cumulative exposure to lakewide contaminants needs to be factored into the assessment.

S.28 Risk Estimation (page 13), paragraph 4. What is the basis for the species cohort tables? What population is Honeywell/Exponent basing the cohort life tables on? How uncertain is this? More information on cohort modeling needs to be provided to NYSDEC to determine whether it is an appropriate analysis. In the "Risk Estimation" section, information on how the data for these variables will be calculated should be provided. The proposed values and calculations for the population dynamic model should be included.

S.29 Risk Estimation (pages 12 through 14). Are stressor and dose-response parameters (i.e., TRVs) going to be evaluated in the probabilistic risk assessment? There are sufficient data to model at least mercury and PCBs using probabilistic methods (see Moore et al., 1999).

S.30 Risk Estimation (pages 13 and 14), equations. The BERA should document how a receptor that requires more than two years for sexual maturity (i.e., osprey) will be addressed.

S.31 Uncertainty Analysis (page 15). The uncertainty analysis should cover uncertainties and variabilities associated with exposure and effects parameters. In addition, uncertainty around the determination of site subpopulations, species rates of mortality and fecundity etc. should be discussed. The uncertainty discussion should be expanded with more details about the proposed analysis. Provide details on how "percent attribution to the variance" is calculated.

S.32 Uncertainty Analysis (page 15), last paragraph. Even parameters that can be quantified in the food chain model have some uncertainty or variability associated with them. These should also be discussed in the uncertainty section. In addition to the uncertainty surrounding the predictive nature of risk analysis, the overall acceptance of this methodology in the scientific and regulatory community should also be discussed.

S.33 References. The complete reference for Calabrese and Baldwin, 1993 (cited on page 12) should be provided.

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PART 2 - COMMENTS ON FOOD CHAIN TABLES AND SUGGESTED CHANGES TO PROPOSED RECEPTOR PARAMETERS AND TOXICITY REFERENCE VALUES - ONONDAGA LAKE BERA

I. Receptor Parameters

The most recent set of proposed receptor body weights, food ingestion rates (dry weight [dw] basis), water ingestion rates, sediment ingestion rates (dw basis), foraging radii, and residence times to be used in the Onondaga Lake BERA were provided in Exponent's Revised Table 2 (January 4, 2001 e-mail from B. Henry, Exponent). These tables generally present only one value (rather than a mean and a range) for each parameter and are assumed to be the values used in the COC screening and proposed for use in the Onondaga Lake BERA. COC screening calculations did not consistently use worst-case assumptions, such as minimum body weight and maximum ingestion rate. ERAGS (USEPA, 1997) recommends using worst-case assumptions to ensure that contaminants that may adversely affect ecological receptors are not screened out.

Proposed BERA receptor parameters are similar to those used in the Geddes Brook/Ninemile Creek BERA. The body weight and ingestion parameters are within acceptable ranges, and can be used in the BERA. The mink weight is low (it is based on the mean of an adult female Montana mink population [Mitchell, 1961]), but can be used in conjunction with average ingestion rates.

The time use factors (TUFs) and ranges for receptors are problematic. Time and area use factors of one should be used for all receptors, including the belted kingfisher, great blue heron, double-crested cormorant, osprey, mallard, tree swallow, red-tailed hawk, and little brown bat. A TUF of one should be used in the deterministic risk analysis due to the time period spent near Onondaga Lake that covers reproduction and growth, which are used as primary endpoints in the derivation of toxicity reference values (TRVs). Area use factors (AUFs) of one should be used for all receptors, as Onondaga Lake is large enough to support them.

Summary and Recommendations: The screening was not conducted using conservative assumptions for all parameters. Use of minimum body weights and maximum ingestion rates, instead of the parameters specified in Revised Table 2, would increase hazards quotients by up to about 60% for some of the receptors. The short-tailed shrew, great blue heron, and osprey weights and ingestion rates used are acceptable. The dietary composition of food ingestion (i.e., percent fish, invertebrates, plants) should be listed for each receptor in a summary table.

Based on time constraints, hazard quotients do not have to be resubmitted to NYSDEC prior to submission of the revised BERA. However, the COC selection for receptors should consider that screening values would have been higher if more conservative assumptions were used.

Residence time and area use factors of one should be used for all receptors in the BERA.

II. Toxicity Reference Values

Avian and mammalian toxicity reference values (TRVs) proposed for use in the Onondaga Lake BERA were most recently presented in Exponent's Revised Table 3 (January 4, 2001). Class (i.e., avian and mammalian), rather than species-specific, TRVs were derived. Only a subset of the TRVs used in the COC screening tables were included in Revised Table 3 and no text was provided to explain TRV derivation. This review discusses only key COC TRVs in the Onondaga Lake BERA. The focus on key COC TRVs does not indicate concurrence with all other TRVs; rather, it serves to focus efforts on the main contaminants posing risk to biological receptors in the Onondaga Lake system.

A description of the methodology used to select the TRVs, including extrapolations from LOAELs to NOAELs, subchronic to chronic studies, between species, etc. was not provided with the tables, which contained only an uncertainty column. Derivation of all TRVs (including parameters used such as dose, food ingestion rate, and body weight) should be provided in the BERA. NOAEL TRVs should be used for risk calculations.

TRVs used in the Geddes Brook/Ninemile Creek BERA should not be automatically used in the Onondaga Lake BERA, as some TRVs (e.g., methylmercury, PCBs, arsenic, aluminum) were commented upon in the November 17, 2000 comment letter to Honeywell (see comments G.6, 6.38, 6.39, 6.40, 6.44) and there were many incomplete references (comment G.5).

Avian TRVs

Methylmercury- Heinz et al.'s series of studies on mallards (1974, 1975, 1976a, 1976b, 1979 as cited in USEPA, 1995) were used to derive a LOAEL of 0.078 mg/kg/day by the Great Lakes Water Quality Initiative (USEPA, 1995). This LOAEL was used as the avian TRV, but a NOAEL TRV should be used in the BERA. USEPA used an uncertainty factor of 6 based on a factor of 3 for interspecies extrapolation and 2 for LOAEL to NOAEL extrapolation. However, Sample et al. (1996) estimates a chronic NOAEL by multiplying the chronic LOAEL by a LOAEL-to-NOAEL uncertainty factor of 0.1 to obtain a final NOAEL of 0.0064 mg/kg/day (no interspecies factor was applied). The difference in LOAELs between USEPA and Sample et al. is due to use of different uncertainty factors and different food ingestion rates (0.156 kg/kg-day and 0.128 kg/kg-day, respectively, each multiplied by 0.5 ppm dietary mercury). Application of a LOAEL-to-NOAEL uncertainty factor of 0.1 is recommended for use in the Onondaga Lake BERA.

DDT and metabolites- Exponent used Anderson et al.'s (1975) chronic study on brown pelicans to derive a DDT NOAEL of 0.0093 mg/kg/day for use in the screening tables. Sample et al. (1996) selected a NOAEL of 0.0028 mg/kg/day based on the same study (Anderson et al. derived only a LOAEL). A NOAEL of 0.0028 mg/kg/day is recommended using a LOAEL-to-NOAEL uncertainty factor of 0.1, rather than the 0.33 factor used. For the BERA, Exponent proposes a DDT LOAEL of 0.6 mg/kg/day (Revised Table 3) based on Heath et al. (1969). This TRV is unacceptable for use in the BERA.

Polychlorinated Biphenyls- Exponent selected a TRV of 0.41 mg/kg/day based on an Aroclor 1248 study on screech owls by McLane and Hughes (1980). However, an Aroclor 1254 study on the ringnecked pheasant by Dahlgren et al. (1972) is preferable for use. Exponent has agreed that the Aroclor 1254 TRV will be used in the BERA to represent all PCBs, as indicated in the e-mail of August 8, 2000 to NYSDEC (Betsy Henry to Timothy Larson).

Mammalian Toxicity Values

Methylmercury - The Wobeser et al. (1976) methylmercury chloride study on mink with a NOAEL of 0.015 mg/kg/day (cited in Sample et al. [1996]) appears to be the best available study for TRV development for mustelids. It is noted that this is a subchronic (93 days), rather than chronic study. The Charbonneau et al. (1976) study with a TRV of 0.02 mg/kg/day selected by Exponent is based on cats, which are in a different taxonomic family than mink, otter, and other mammalian receptors. The reference for the Charbonneau et al. TRV was not provided in the Geddes Brook/Ninemile Creek BERA (see comment G.5 of November 17, 2000 comment letter to Honeywell) and therefore no comments were made on it.

Revised Table 3 and receptor screening tables sent on December 15, 2000 present a Charbonneau-based methylmercury TRV of 0.02 mg/kg/day, but a methylmercury TRV of 0.046 mg/kg/day was used in the screening tables submitted in February 2001 for all mammalian receptors, underestimating methylmercury hazard quotients.

Polychlorinated Biphenyls- For the PCB mammalian TRV, a multigenerational mink study is recommended to derive the TRV, rather than the Aulerich and Ringer (1977) 4.5 month-long study. Restum et al. (1998) fed seven-month-old mink diets containing various amounts of PCB-contaminated carp from Saginaw Bay, Lake Huron; the study was continued over two generations. Mink fed the contaminated diet before and during reproduction had reduced reproduction and/or growth and survival of offspring. Concentrations of other contaminants were measured and were substantially lower than concentrations of PCBs. The dietary LOAEL for reduced growth rate of kits in the F1 generation was 0.04 mg PCBs/kg/day. Mean weight of F1 kits of mothers in the 0.04 mg PCBs/kg/day group was 15% lower than controls at 6 weeks of age. Because this was the lowest concentration of PCBs tested, a LOAEL-to-NOAEL conversion factor of 0.1 is used to estimate a NOAEL. Because the study was conducted for a relatively long period (6 months until weaning of F1 generation) over a sensitive life stage (reproduction), a subchronic-to-chronic conversion factor is not applied. On the basis of this study, the LOAEL TRV for the mink is 0.04 mg PCBs/kg/day and the NOAEL TRV for the mink is 0.004 mg PCBs/kg/day. Although the Aulerich and Ringer (1977) PCB TRV was previously recommended for use (see comment 47 of the March 15, 1999 letter from T. Larson and P. Bein to A. Labuz on the draft Lake BERA), the recent Restum et al. study appears to be more appropriate for TRV development.

Summary and Recommendations:

Avian and mammalian methylmercury and PCB TRVs and the avian DDT and metabolites TRV should be revised as noted in the previous section. Deviations of all TRVs used should be provided in the BERA text.

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